

# INCAS research work on the Clean Sky 2 High-Speed Compound Helicopter Demonstrator in 2017

The Clean Sky 2 High-Speed Compound Helicopter Demonstrator Project (LifeRCraft) builds on a wide European network of industrial and research partners, including INCAS, that brings the technical skills and know-how of its researchers for developing an eco-friendly compound helicopter with vertical agility at affordable operating costs; it opens up new mobility roles, mainly in hostile environments, being capable to land on unprepared surfaces and providing crucial emergency (search and rescue, coastguard and border patrol) and door-to-door transportation services, flying further and faster with an increased speed exceeding 220kt (410 km/h) and with less fuel consumption.

In partnership with Airbus Helicopters (AH), the Romanian Consortium (RoC) composed by INCAS and ROMAERO SA, is playing a significant role in this project by providing in the end, the whole central fuselage structure (Main Fuselage). The main work packages for which RoC is responsible are the project management, advanced airframe design, fuselage manufacturing and support documentation for permit-to-fly.

The link between INCAS and AH for data exchange is made through a dedicated network using specific software as ENOVIA PLM. In addition, various work sessions are organized at Airbus Helicopters Germany facilities in Donauwörth, giving an opportunity for the project partners to share ideas, concepts and technical solutions.

The current status of the INCAS work includes fuselage design activities and pre-sizing calculations for the main structural components, coupled with activities related to the assembly logic (Build Philosophy), assimilation and optimization of manufacturing composite parts.

The complexity of the project consists in the management of a large number of interfaces with the systems to be installed in the fuselage, tight weight requirements imposed by the project and cost minimization by optimizing the chosen technical solutions for the fuselage structure. Also, the multitude of the fuselage sub-system requirements (operational, functional, environmental etc.) that have to be verified and validated during the design and manufacturing phases represents a big challenge for the RoC team.

The technical solution is based on a hybrid metallic and composite structure that have to ensure a proper barrier between dissimilar materials against galvanic corrosion and a compatible technical solution for materials with important gap between thermal expansion coefficients.

The fuselage structure is designed mainly using specific software for aerospace, imposed by the AH in order to ensure the compatibility of the 3D digital mock-up or stress simulations between all the project partners. The principal design and stress activities are using CATIA V5, NASTRAN / PATRAN, used by large aviation companies and software programs developed in previous international projects. Withal, INCAS collaborates with ROMAERO SA, the manufacturing partner, in order to establish the manufacturing technologies for the fuselage components. The optimized technologies applied in the project that have also to comply with REACH regulations will have a big positive impact for the design and manufacturing duration, necessary human resources, price and not least on the environment.

The 3D design activities will be completed this year, during an evaluation session from AIRBUS HELICOPTERS.

\*RoRCraft stands for Rotorcraft Fuselage Manufacturing for LifeRCraft Demonstrator



"When you find a solution to a technical problem, you open the path of ten new challenges. Converging on this process is really the beauty of research."

Dipl. Eng. Dorin Bârsan, RoRCraft\* Project Manager, INCAS



"Designing the RoRCraft fuselage is more than just stitching parts together. It's coming up with ideas, testing principles and perfecting the engineering right until its maiden flight."

Dipl. Eng. Radu Bîscă, RoRCraft\* Lead Stress, INCAS



"The main challenges in this project are linked to the requirements management and trade-off assessment of technical solutions, linked with the Demonstrator's target to be as close as possible to a serial product. Working closely with a valuable design team for which the surpassing of a challenge has become a passion, makes me confident about the success of this project."

Dipl. Eng. Adrian Gâz, RoRCraft\* Lead Design, INCAS





CS2 Design Team analyzing the fuselage structure in the Virtual Reality Room